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When a glass-forming liquid is supercooled to the glass transition temperature (T_g), the structural degree of freedom decreases, causing a loss of the configurational heat capacity ($C_{p,conf}$). In borate-silicate mixed glasses, the $C_{p,conf}$ exhibits a non-linear increase with substitution of B_2O_3 for SiO_2.[1] However, its structural origin has not been well understood. In this work, through Raman spectroscopy measurements, we have found an implication for the intermediate range order (IRO) structural connection to the composition dependence of $C_{p,conf}$ in a series of $(75q)B_2O_3$-$(75(1-q))SiO_2$-$15Na_2O$-$10CaO$ glasses.[2] In the silica-rich composition, the increase of the content of B-O-Si network units ($[B_2Si_2O_8]^{2-}$) and 6-membered borate rings causes the rapid increase of the $C_{p,conf}$ with the addition of B_2O_3. In the boron-rich composition, the $C_{p,conf}$ is almost constant, which is likely attributed to the counteraction between the decrease of the fraction of metaborate groups and the increase of the fraction of other borate superstructural units. As shown in Fig. 1, compared to short range order (SRO), the overall results suggest that the IRO structural change has a dominant contribution to the evolution of $C_{p,conf}$ with composition. Furthermore, IRO is also found to govern the composition dependence of dynamic fragility, as illustrated in Fig. 2, implying that $C_{p,conf}$ can be seen as the thermodynamic fragility in the studied system.

1 M. M. Smedskjaer, J. C. Mauro, R. E. Youngman, C. L. Hogue, M. Potuzak and Y.Z. Yue, *J. Phys. Chem. B*, 115, 2011, 12930.
2 H. Liu, M. M. Smedskjaer, H. Z. Tao, L. R. Jensen, X. J. Zhao and Y. Z. Yue, *Phys. Chem. Chem. Phys.*, 18 (16), 2016, 10887.